

$$Z = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}} \quad \text{if } \sigma \text{ is known.}$$

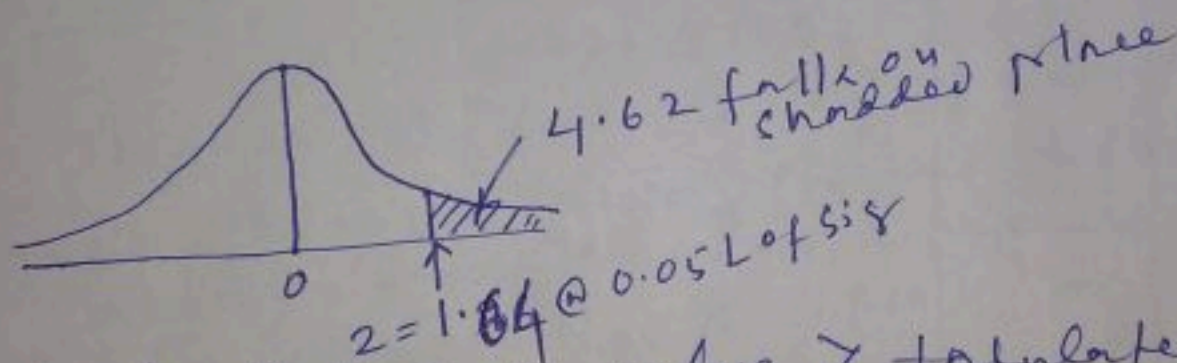
if σ is not known then

$$Z = \frac{\bar{X} - \mu}{s / \sqrt{n-1}}$$

In our test σ is not given. Hence we use second formula i.e. $Z = \frac{\bar{X} - \mu}{s / \sqrt{n-1}}$

$$Z = \frac{3.0 - 2.7}{0.7 / \sqrt{117-1}} = 4.62 //$$

Calculated $Z = 4.62$



Calculated Z value $>$ tabulated Z value

So H_0 is rejected.

Hence there is a significant difference between μ & \bar{X} .
Hence $H_0: \bar{X} \neq \mu$

Formula

$$SE_M = \sigma_M = \text{Standard Error of Mean} \\ = \sigma / \sqrt{n} \quad \& \quad s / \sqrt{n-1}$$

Hence

$$\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

Q) $n = 400$ (Sample Size)

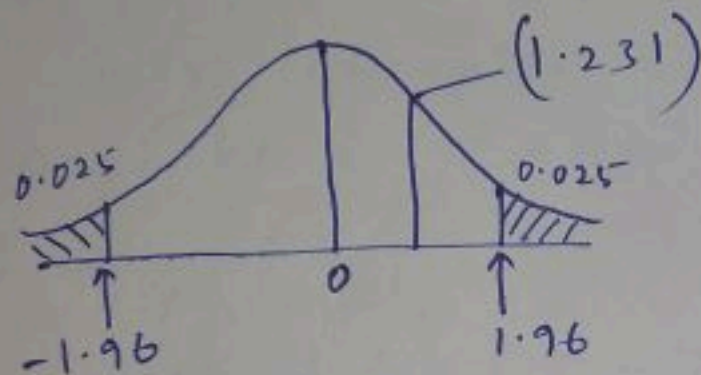
$\bar{X} = 67.47$ (Sample mean)

$\mu = 67.39$ (Population mean)

$\sigma = \text{S.D of population} = 1.3$

$N = \text{Population Size (not known)} = ?$

$$\Rightarrow Z = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}} = \frac{67.47 - 67.39}{1.3 / \sqrt{400}} = \underline{\underline{1.231}}$$



Decision:- The obtained Z value $<$ table value
i.e., $1.231 < 1.96$

Hence H_0 fails to reject (accepted)
So there is no significant difference
between sample mean & population mean.
Hence $H_0: \bar{X} = \mu$

	Hourly earning	S.D	n
Q) Mumbai City	\$ 8.95	0.4	200
Delhi City	\$ 9.1	0.6	175

Co. has to test @ 5% Level of significance.

Ans It is a two sample t test
as μ_1 & μ_2 are given
also sample are more than 30 each,
Hence it is called 2 sample Z test

$$H_0: \mu_1 = \mu_2$$

$$H_a: \mu_1 \neq \mu_2 \quad (L \& T)$$

$$\sigma_{x_1 x_2} = \sqrt{\frac{(\sigma_1)^2}{n_1} + \frac{(\sigma_2)^2}{n_2}}$$

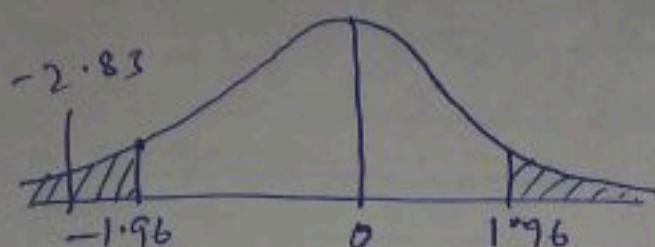
$$\sigma_{x_1 x_2} = \sqrt{\frac{(0.4)^2}{200} + \frac{(0.6)^2}{175}} = \$ 0.053 //$$

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sigma_{x_1 x_2}}$$

$$= \frac{(8.95 - 9.1) - 0}{0.052} \longrightarrow \boxed{\mu_1 = \mu_2 = 0 \text{ in Hypothesis}}$$

$$= -2.83 //$$

The table value of Z is -1.96 //



The calculated value $>$ tabulated value
 $\Rightarrow -2.83 > -1.96$

Hence H_0 is rejected & H_a is accepted
 So there is a significant difference
 between the earnings of two cities.

(Q) In a provincial election, 55% of voters rejected Lotteries. A random sample of 150 rural communities showed that 49% of voters rejected Lotteries. Is the difference significant?

Ans Sample is more than 30 i.e. 150
 So it's a Z test.

Proportions are given (%) instead of No.s.

P_s = Sample proportion =

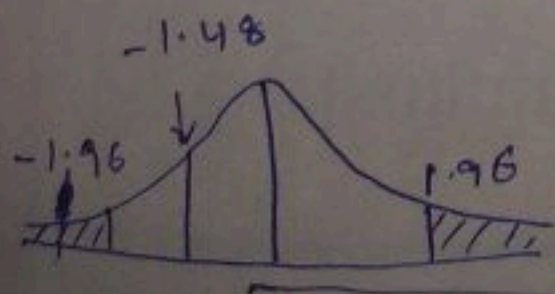
P_U = Population proportion =

$$Z = \frac{(P_s - P_U) / \sqrt{P_U(1 - P_U) / N}}$$

$H_0: P_s = P_U$; $H_a: P_s \neq P_U$

$$Z = \frac{0.49 - 0.55}{\sqrt{0.55(1 - 0.55) / 150}} = -1.48$$

2 value @ 0.025%



Calculated value $= -1.48$
 Tabulated value $= -1.96$
 i.e. $-1.48 < -1.96$

Hence H_0 fails to reject (accepted)
 there is no significant difference between two proportions.